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Instrumentation Amplifier with Improved CMRR

H. Bonekamp

This circuit is a relatively simple instrumentation amplifier that can be powered from a single 5-V supply. The output voltage is given by the formula:

$$U_O = 2.5V + \frac{R4}{R5}\cdot\left(1+\frac{R2}{R3}\right)\cdot\left(U1-U2\right)+\left(1+\frac{R4}{R3}\right)\cdot U1-\frac{R4}{R3}\cdot\left(1+\frac{R2}{R1}\right)\cdot U2$$

For the optimum CMRR, the ratio of R1 to R2 should be the same as that of R3 to R4. If we let R1 = R4 and R2 = R3, the formula becomes:

$$U_O = 2.5V + \left(1+\frac{R1}{R2}+2\cdot\frac{R1}{R5}\right)\cdot\left(U1-U2\right)$$

Thanks to the 2.5-V reference voltage provided by IC1, this circuit can work with a single supply voltage. With regard to common-mode voltage range, it is important that R2/R1 < 1, since otherwise IC2a will be driven to its limit too quickly by the common-mode voltage! The current consumption of this circuit is approximately 10 mA.

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